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Ten years of personal experience in using low power laser in clinical treatments

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Low Power Lasers (LPL) remain controversial tools in clinical practice. We have ten years experience in this field and we thought that it will be useful to present our most important double blind placebo controlled studies, regarding LPL therapy.

During these years, we have used red diode laser 8 mW, continuous emission, 680 nm wavelength; HeNe laser 632 nm wavelength, 2mW power; IR diodes laser, wavelength 780 nm, continuous emission 3.5mW; IR diodes laser, wavelength 880 nm, pulsed emission, output power 3 mW.

The main field of clinical application remains rheumatic diseases, responding well and very well to LPL, excepting perhaps elbow epicondylitis. The maintenance of good effects is very individual, but also disease dependent.

In dermatology there are some diseases responding very well, even spectacular, as for example crural ulcers of different causes. In this particular case, the results are visible every day and can be measured.

We also use LPL in the recovery of the distal forearms nerve lesions after surgical suture. We controlled the improvements by electromiographical measurements (EMG) and we noticed half shortening recovery when used LPL.

These observations and some others mentioned in this paper could be arguments for the real efficacy of LPL in clinical practice.

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DOUBLE BLIND CROSS-OVER CLINICAL STUDY OF 830NM DIODE LASER AND 5YEARS CLINICAL EXPERIENCE OF BIOSTIMULATION IN PLASTIC & AESTHETIC SURGERY IN ASIANS.

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PURPOSE: To determine the clinical biomodulation effect of diode laser on wound healing and keratinization.

METHODS: Thermal photobioactivation with high power diode laser 10W(Diomed Co. U.S.A.) 1.2 Joule (1Watt x 1.2sec)
Nonthermal photobioactivation with low power diode laser 60mW (Mochida Co Japan) 1.2 Joule (60 mW x 3 minute 20 sec) pulsed mode stimulation compaired. And follow up 1 day , 7day , 1month, 2month, 6 month, 2years compaired,estimation of the 100 patient for 5 years with photographic records.

RESULTS: wound healing response - laser dose dependent, nonthermal biomodulation effect appear more than 7 days however thermal biomodulation effect show immediately.

CONCLUSION :As a light LLLT with diode laser is effective in initial period of wound healing as adjuvant therapy, but HLLT is effective in late period of wound healing .

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Low Intensity Laser Biostimulation

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In this paper, low intensity laser biostimulation was studied by use of identical model and time approach on generation of biological information. It was shown that the biological effects of low intensity laser on a biological system are realized by the cascade amplification of the physical amplification of the superradiation state of the information unit of the biological system and the subsequent biological amplification of the transmembrane signal transduction. For the biological amplification, the biological information model of low-intensity laser (BIML) and the biological information transformation model of low-intensity laser (BITML) were put forward. BIML has been stated in the paper 'direct interaction of light with cells in photodynamic therapy' in this proceedings. According to BITML, under nondamadge condition, the biological effects of a laser irradiation would transform into the biological effects of the laser irradiation of its opponent color if its dose is larger than the corresponding threshold value. Their successful applications at the cellular level and the clinical level shown that the cascade amplification holds for the direct interaction of low intensity laser with a biosystem, and BIML and BITML hold for light-cell interaction.

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Photodynamic therapy of cancer - clinical analysis of 308 cases.

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In 1992 - 1997 more than 1270 malignant tumours of skin, breasts, tongue, oral mucose, lower lip, larynx, stomach, bladder, rectum and other localizations in 308 patients have been treated with PDT. Most of the patients have been taken into PDT for tumour recurrences or intradermal metastases after surgery, gamma-therapy or combined treatment. A certain number of patients had not been treated before due to severe accompanying diseases or old age.

Russian photosensitizers Photoheme in dosage 1 - 5

mg/kg body weight, and Photosense in dosage 0.7 - 1.0 mg/kg body weight were used.

Up to date we possess the follow-up data in term from 2 months to 5 years. Therapeutic effect took place in 94.7% of cases, including complete tumour resorption in 55.5% and partial resorption in 39.2% of cases.

The results of PDT application for treating malignant tumours allow one to estimate PDT as adequate technique and in some tumour localizations PDT may become optional technique.

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Removal of an arteriosclerotic region of blood vessels by a free-electron laser

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ABSTRACT

Recently, a linac-driven Free Electron Laser (FEL) system covering a wide range of wavelength from ultraviolet to infrared has been developed at Free Electron Laser Research Institute, Inc. (FELI). Compared with conventional lasers, FELs offer a number of important advantages. The first and most obvious one is that an FEL can be easily tuned in wavelength. For example, at an electron beam energy of 31 MeV, an FEL can be continuously varied in the range of 4.8 to 9.7 μm at FELI. The FEL can find users in medicine, in procedures like cutting tissues by photo-thermal effect, ablating hard tissues by photo-mechanical effect, and also modifying surface by photo-chemical effect. The effect of FEL-tissue, or cell interaction is an attractive area for researchers who are focusing on the modification of molecules such as cholesterol ester in the atherosclerosis. The characteristic of atherosclerosis is the accumulation of a large amount of lipids, mainly cholesterol ester, in the arterial wall. In this paper, we described the dissociation of the cholesterol ester in arteriosclerotic region of blood vessels by a tuned FEL to the ester stretching vibrational mode as a possibility of surgical treatment.

The experimental results showed that the prominent peak absorbance of cholesterol ester at 5.75 μm was changed from 1.75 to 0.4. This means that the cholesterol ester was modified by the 3 min FEL irradiation. In conclusion, the IR- FEL can be used for the removal of cholesterol ester without the damage of normal tissue.

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ACCESSIBILITY AND RELIABILITY OF CUTANEOUS LASER SURGERY INFORMATION ON THE WORLD WIDE WEB

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The world wide web has provided the public with easy and affordable access to a vast range of information. However the accuracy and true value of such information has yet to be examined. The purpose of this study was to assess the availability and reliability of the web sites containing cutaneous laser surgery information and to evaluate this resource for the quality of patient and provider education.

Three search engines, Altavista, Excite and WebCrawler, identified over 500,000 possible sites. Based on their priority of retrieval the top 100 sites of each search engine (a total of 300 sites) were reviewed. Of these 136 were original web sites, 158 were multiples or duplicates and 3 were commonly shared by all three search engines. After elimination of duplicates, 40 sites were evaluated for content and the currency of information. Twenty-six of the 40 reviewed pages represented services of a Board Certified Physician. Eleven sites described potential contraindications, 3 - pre-operative preparations, 30 - post-operative care and recommendations for the healing process, 28 - methods of pain management, and 22 - before and after photographs of patients. Twenty-five had been updated within the past 6 months.

Our findings suggest that advertisements for services exceed useful, scientific information. Due to duplication and the prioritization systems of search engines, the ease of finding sites did not correlate with the quality of the site's information.

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In Vitro and In Vivo Photosensitizing Capabilities of 5-ALA Compared to Photofrin^R in Vascular Endothelial Cells

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Purpose: Complicated hemangiomas are unique situations in which intervention with the proper laser is an ideal solution. It is our goal to evaluate photosensitizing activities of 5-ALA and Photofrin^R using in vitro and in vivo models.

Materials and Methods: The in vitro photosensitizing activities of 5-Aminolevulinic acid (5-ALA) and Photofrin^R were examined from their location of absorption in a microvascular endothelial cell (MEC) culture system. The measurement of the percentage of MEC killed by various drug concentration at 630 nm wavelength was measured by either Live/Dead assay or LDH assay. Similarly, the in vivo biological activities of 5-ALA and Photofrin^R exposed to various total light dosage at 630 nm wavelength was studied by determining the amount of necrosis produced in chicken combs.

Results: MEC incubated with 5-ALA at 630 nm wavelength, concentration of about 35 $\mu\text{g}/\text{ml}$, illuminated by 100 mW/cm^2 of laser light showed 50% cell kill. Those cells treated with Photofrin^R at concentration of about 3.5 $\mu\text{g}/\text{ml}$ and 100 mW/cm^2 exhibited 50% cell kill. Chicken combs that received 200 $\mu\text{g}/\text{kg}$ of 5-ALA at power density of 80 mW/cm^2 had depth of injury of 362 ± 27 μm upon histological examination. Those combs that received 100 or 120 mW/cm^2 showed depth of injury of 732 ± 29 and 792 ± 36 μm respectively. Chicken combs that received Photofrin^R at 2.5 $\mu\text{g}/\text{kg}$ had depth of injury of 535 ± 22 μm at a power density of 80 mW/cm^2 . Those combs that received 100 or 120 W/cm^2 showed depth of injury of 795 ± 32 , 805 ± 49 μm respectively.

Conclusions: Both 5-ALA and Photofrin^R have the capabilities for destruction of human microvascular endothelial cells. However, Photofrin^R has achieved a higher degree of cell and tissue destruction at either lower drug concentration or lower power density.

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LOW INTENSIVE LASER IRRADIATION
DESTRUCTIVE ACTION.Chichuk T. V.¹, Stranadko E. F.¹, Klebanov G. I.².¹State Scientific Centre of Laser Medicine, Moscow;²Russian State Medical University, Moscow.

The laser irradiation are used at photodynamic tumor therapy (PDT). For PDT the ekzogenic photosensitizers (FTS) are administered into the patients intravenously. Under laser irradiation FTS interact with light and initiate free radicals reactions. As a result of destroys tumor's cells. Herewith occur free-radical lipid peroxidation lipids (LPO) of cell's membranes, denaturation of cell's proteins and nucleic acids. Effect LPO be increase permeability of cell's membranes (how tumour so and normal tissues) and in total death of cells. Like process can occur and in the event of laser therapy, herewith as FTS may be endogenic porphyrins. In connection with foregoing the goal of this work is to study the laser-induced photosensitized LPO lipids of artificial (liposomes) and cell's (erythrocytes) membranes and human blood lipoproteins. As a ekzogenic FTS we are used hematoporphyrin derivatives (HPD) and sulfonated phthalocyanine aluminumium (Pc). We are registered concentration of TBA-active products of lipid oxidation. Interaction of ekzogenic FTS with membranes and concentration of FTS in the lipoproteins was determined by fluorimetric method. The process of lipid peroxidation of liposome's and erythrocyte's membranes was found to be activated by LI in the presence of HPD or Pc. In case of the endogenic porphyrin in blood lipoproteins and erythrocytes were received the analogous results. Unlike event with ekzogenic FTS in this case concentration TBA-active products of lipid oxidation be less, however in the same way depend how from dose laser irradiation, so and from concentration FTS. It was found out that only 4% HPD and 8% Pc were incorporated into membrans of liposomes. Calculation of concentration FTS in liposome's membranes are shown, that per 10 thousand molecule phospholipids happen to 16 molecule HPD or 3 molecule Pc. It was noticed that, after incubation HPD or Pc with human erythrocytes - 1-3% of photosensitizers were incorporated into membrans of cells, after incubation HPD or Pc with apo-b-lipoproteids - more than 50%.

fluorimetric method with Fura-2AM. It was found out that LI initiate a change basal level calcium in the leucocytes's cytoplasm. These process depend how from dose irradiate, so and from concentration of the PHS. Results of this work allow to formulate basic thesis of free radical mechanism laser therapy.

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PERCUTANEOUS MICRODECOMPRESSIVE ENDOSCOPIC THORACIC DISCECTOMY WITH LASER THERMODISKOPLASTY FOR NON-EXTRUDED THORACIC HERNIATED NUCLEUS POLPOSUS.

John C. Chiu, M.D., Thomas Clifford, M.D., Mark Greenspan, M.D., Felix Negron, M.D., Robert A. Princenthal, M.D., Joan Carter, R.N.

Our purpose is to demonstrate the safety and efficacy of outpatient percutaneous microdecompressive endoscopic thoracic discectomy with laser thermodiskoplasty, performed for symptomatic thoracic herniated nucleus polposus.

Between 1996 and 1997, 40 (56 discs) prospective consecutive cases with symptomatic thoracic discs without myelopathy, who failed at least 12 weeks of conservative care, were treated. The technique of percutaneous microdecompressive endoscopic thoracic discectomy (with laser thermodiskoplasty) by posterolateral approach was described. The thoracic disc levels were T2 to T12. All patients demonstrated a contained soft thoracic disc herniation on MRI or CT scans. Intraoperative thoracic discogram and pain provocative tests were positive and confirmed the disc involved.

Preliminary postoperative follow-up demonstrates 95% of all patients had symptomatic relief. There were no postoperative complications. One patient demonstrated persistent thoracic pain and paresthesia. The average time to return to work was ten days for the non-workers' compensation patients. Most of the patients received non-ablative lower laser energy application for thoracic disc shrinkage or tightening.

In conclusion percutaneous microdecompressive endoscopic thoracic discectomy with added application of non-ablative lower Holmium laser energy for disc shrinkage (laser thermodiskoplasty) appears to be easy, safe and efficacious. This less traumatic outpatient treatment leads to excellent results, ease, faster recovery, and significant economic savings.

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THE LASER-UNDUCED PRIMING OF BLOOD LEUCOCYTES.

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We investigated the influence of He-Ne ($\lambda = 632.8$ nm) laser irradiation (LI) on a functional activity of human blood's leucocytes. For this was used the method of luminol-dependent chemiluminescence with zymozan-stimulation of the phagocytes. The leucocytes were irradiated without and in whitness of ekzogenic (phthalocyanine) and endogenic (phthalocyanine and/or porphyrins) photosensitizers (PHS). Plasma of patient with broncho-pulmonal pathology maintain PHS - endogenic porphyrins. Patient with oncologic pathology have been treated by photodynamic therapy and their plasma maintain PHS - sulphonated phthalocyanine aluminumium. Concentration of PHS in plasma was determined by fluorimetric method. It was found out that lazer irradiation initiate a priming of the leucocytes, which reveal itself after zymozan-stimulation of the phagocytes. Leucocytes's functional activity was changed after LI without and in whitness of ekzogenic PHS. In addition LI raise the functional activity of the leucocytes in presense of plasma with phthalocyanine. Further increase of the LI dose lead to decrease CL-response of leucocytes. We discovered that increase the concentration of phthalocyanine in plasma (from 0.05×10^{-12} to 1.2×10^{-12} m), which are added to cells lead to change their functional activity (increase at first and then decrease). In the case of the endogenic porphyrins (approximately 10^{-12} - 10^{-13} m) in plasma were received the analogous results. Since for the priming important role belong to the calcium ions that us be studied change concentration of the calcium in the leucocytes's cytoplasm. For this was used

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PERCUTANEOUS MICRODECOMPRESSIVE ENDOSCOPIC CERVICAL DISCECTOMY WITH RECENTLY ADDED APPLICATION OF NON-ABLATIVE LOWER LASER ENERGY (LASER THERMODISKOPLASTY) - 180 CASES, 1997.

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Our purpose is to demonstrate safety, efficacy and technique of outpatient Percutaneous Microdecompressive Endoscopic Cervical Discectomy performed for symptomatic cervical herniated nucleus polposus. In addition, lower energy of non-ablative Holmium laser has been applied for shrinkage and tightening effect on the disc.

Between 1994 and 1997, 180 patients who failed at least 12 weeks of conservative care were treated. Levels were C3 to C6, inclusive. All patients demonstrated unilateral radicular pain of a specific dermatome confirmed with EMG/NCV. MRI or CT scans demonstrated a contained soft cervical disc. Percutaneous Microdecompressive Endoscopic Cervical Discectomy technique is described. Non-ablative lower Holmium laser energy was added for disc shrinkage.

Our results show that an average follow-up of 18.1 months (4 months to 36 months) 93.9% of patients had symptomatic relief. There were no postoperative complications, except one mild diskitis treated with intravenous

antibiotics with cure. Holmium laser at non-ablative lower level has been utilized to shrink or to tighten the disc. Only eleven patients (6.1%) demonstrated residual persistent neck and upper extremity pain associated with paresthesia. Average time to return to work was ten days for the non-workers' compensation patient.

In conclusion this Percutaneous Microdecompressive Endoscopic Cervical Discectomy with added application of non-ablative lower Holmium laser energy for disc shrinkage (laser thermodiskoplasty) appears to be easy, safe and efficacious. This less traumatic outpatient treatment leads to faster recovery and significant economic savings.

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APPROPRIATE INDICATIONS FOR MULTIPLE HERNIATED SPINAL DISCS TREATED WITH ENDOSCOPIC MINIMALLY INVASIVE SPINE SURGERY.

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Our purpose is to demonstrate the ease, safety and efficacy of this type of outpatient percutaneous microdecompressive endoscopic spinal discectomy performed for symptomatic herniated spinal discs, involving more than one area of the spine. Between 1995 and 1997, 100 prospective consecutive cases of 250 symptomatic spinal discs, in spite of at least 12 weeks of conservative treatment, were treated with percutaneous microdecompressive endoscopic spinal discectomy with low level non-ablative Holmium laser energy for laser thermodiskoplasty, i.e., collagen tissue and of shrinkage/tightening effect of Holmium laser. All cervical and lumbar herniated discs demonstrated positive MRI scan of CT scan findings and mostly positive tests of EMG and NCV tests for cervical and lumbar discs. MRI or CT scans demonstrated contained soft intervertebral disc herniation on all cases. The demographics of the cases are 112 lumbar discs, 75 cervical discs, and 13 thoracic discs.

Postoperative follow-up demonstrates 95% (95 patients) of all patients had symptomatic relief. There were no intraoperative or postoperative complications. Two patients demonstrated persistent mild residual pain and paresthesia. The average time to return to work was 10 days for the non-workers' compensation patient. A computerized finite model of the herniated disc pre and post laser discectomy with collagen tissue tightening or shrinkage, i.e., laser thermodiskoplasty at the collar and the shoulder of the disc is presented. It demonstrates the results of a computerized model for heat induced collagen tissue and the disc shrinkage and contraction for the purpose of disc decompression in spinal discectomy.

In conclusion appropriate surgical indication for multiple level of spinal discs microdecompressive endoscopic spinal discectomy with laser thermodiskoplasty appears to be easy, safe and efficacious. This less traumatic outpatient treatment leads to excellent results, ease, faster recovery, and significant economic savings.

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ATROPHODERMA VERMICULATA - IMPROVEMENT IN ERYTHEMA AND SKIN ROUGHNESS WITH PULSED TUNABLE DYE LASER THERAPY.

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Atrophoderma vermiculata is characterised by follicular keratosis, vasodilation, and a variable degree of atrophy of the cheeks, pre-auricular area and occasionally forehead. Treatment to date, including topical keratolytics, vitamin D3 analogues, and topical and oral retinoids are relatively ineffective. The pulsed dye laser (PDL) has been used successfully to treat the erythematous element of a number of skin disorders. The aim of this study was to evaluate the use of the PDL, not only examining the reduction in erythema, but also to assess whether there was any reduction in skin roughness produced by the follicular keratoses.

10 patients have been examined, 5 males and 5 females, age range 6 to 23 years (mean 15 years). Treatment has been carried out with

the Candela SPLT1 pulsed dye laser at 585nm, 450 μ second pulse duration, and 5mm spot diameter, using contiguous non-overlapping spots. Treatment energies have ranging from 6.0 to 7.5 J/cm². Review and re-treatment of the involved areas has been carried at 2 monthly intervals. Patients to date have received between 2 and 4 treatments. For most patients the treatment is still on-going.

Clinical improvement has been noted in all patients after each treatment, not only in a reduction in erythema, but in all but two of the patients a clinical reduction in roughness in the treated area. The youngest patient was withdrawn from further treatment after two visits due pain intolerance during the treatment period. Treatment has been well tolerated by all other patients, who have reported no significant local pain after the immediate treatment period. No adverse reactions, in particular scarring or hyperpigmentation, have occurred in any of the patients.

Our results suggest that treatment with the PDL should be considered as a treatment option in patients with ulerythema.

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COMPARISON OF POSTOPERATIVE TREATMENT FOR LASER RESURFACING (PRECLINICAL AND CLINICAL EVALUATIONS) Stephen C. Davis, Van Badiavas, Marta Rendon-Pellerano* and Rube J. Pardo†: University of Miami School of Medicine, Department of Dermatology & Cutaneous Surgery, †Coral Gables Dermatology and Laser Center, *Cleveland Clinic Florida

Purpose: To determine the effect of post-treatment after short-pulsed CO₂ laser resurfacing.

Methods: Young pigs (4) underwent laser resurfacing and sites were randomly left untreated (air exposed) or treated with petroleum base ointment or one of the following types of dressings; a hydrocolloid, hydrogel or foam. Biopsies were taken from each treatment group on various postoperative days (2,3,4,5,8,12 and 19). All samples were stained with H&E. Each histologic slide was evaluated by a blinded investigator.

Results: Histologic differences were observed between treatment groups, i.e., amount of cellular infiltrate, presence of necrotic tissue, progression of the epidermal sheet, maturation of the epidermis, presence of rete ridges and appearance of new collagen.

Conclusions: Post operative treatments can influence the histologic characteristics of laser resurfacing.

In addition, a case report will be presented of a patient who received laser resurfacing on both sides of the face. One side was treated with a foam dressing and the other with petroleum based ointment. A series of photographs taken throughout the year and cosmetics results will be presented.

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LASER STRESS WAVES CAN FACILITATE *IN VIVO* TRANSDERMAL DRUG DELIVERY

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In clinical drug therapies, topical application allows a drug to be localized at the site of interest. This enhances the therapeutic effect of the drug while minimizing systemic side effects. Therefore, the development of an effective way for topical drug delivery has been the subject of extensive research. We have recently demonstrated that laser stress waves can increase the permeability of the stratum corneum *in vivo*. Molecules proximal to the skin can diffuse into the

epidermis and dermis under the concentration gradient. Stress waves were generated by ablation of a target material by a Q-switched ruby laser. A single stress wave (500 bar peak stress and 300 nsec duration) was applied onto the skin on the dorsal side of male fuzzy rats with the donor solution acting as the acoustic coupling medium. In this experimental arrangement the laser radiation was totally absorbed by the target material so that the skin was exposed only to stress waves. Rhodamine B dextran (40 kDa molecular weight) in aqueous solution was used as the probe molecule. Fluorescence microscopy revealed that the probe molecules penetrated to a depth of ~50 μm and in some places as deep as 100 μm . The combined thickness of the stratum corneum and epidermis in the fuzzy rat is ~30 μm . The probe molecules, therefore, were transported through the epidermis into the dermis. The permeabilization of the stratum corneum was transient and the barrier function of the skin recovered within a few minutes. No adverse effects on the rat skin were observed in this study.

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THE SUCCESSFUL USE OF THE PHOTODERM VL IN THE TREATMENT OF A CAVERNOUS HEMANGIOMA IN A DARK-SKINNED INFANT
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The Photoderm VL is an FDA approved medical device which delivers intensified pulsed light at various wavelengths to a target source. Using the principles of selective photothermolysis, the Photoderm VL has been shown to be effective in the treatment of various vascular lesions, including spider and varicose veins, telangiectasias, port-wine stains and hemangiomas. Adverse reactions have been reported in a small number of patients. These have included immediate responses of purpura (7%) and edema (5%); transitory effects include hyperpigmentation (4%), hypopigmentation (3%), blister/burn (2%), scar (0.5%), crusting (0.4%) and epidermal atrophy (0.3%). Due to the risks of pigmentary alterations, especially hypopigmentation, treatment in dark-skinned individuals has been minimal. We report the successful use of the Photoderm VL in a dark-skinned infant with an ulcerated cavernous hemangioma not responding to other modalities.

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SCAR TREATMENT WITH THE LASER

Richard O. Gregory, Celebration Laser Center, Celebration, FL

The diversity of scar presentation ranging from the "ice pick" acne scar to the hypertrophic, nodular scar with traumatic tattooing resulting from auto accidents requires a diversity of treatments. The author will present an organized approach to scar management with the laser. Excellent results have been obtained with the following laser techniques: Punch elevation of depressed scars followed by laser resurfacing; Shrinkage of hypertrophic scars followed by laser resurfacing; Reduction of widened scars by laser "honeycombing"; Laser planing of elevated, mature scars, and laser depigmentation of traumatic scars. A variety of patients will be shown to demonstrate techniques and results.

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THE VERSATILITY OF THE COHERENT VERSAPULSE LASER

Richard O. Gregory, Celebration Laser Center, Celebration, FL

Heretofore medical lasers have generally been of the "black box" concept with few variable controls and quite specific tasks that were performed very well. Unfortunately, this has limited the results achieved by the lasers when a broad spectrum of targets were present. Such examples of these "black box" lasers are the flashlamp pumped dye laser which targets a specific size and depth of vessel very well but leaves other vessels under treated, and the Q-switched Nd:YAG laser which fails to treat green tattoo dyes well. These shortcomings have been addressed by the Coherent Versapulse laser. A series of 25 patients have been studied which have previously undergone treatment with a variety of lasers for various conditions. Disorders that have been treated include port wine stains, telangiectasias, and tattoos. Prior treatments with a variety of lasers have numbered up to 10 with the average being 3 to 4, and in every instance had achieved early good results which have plateaued with continued treatments. Subsequent treatment with the Versapulse have numbered up to 3 with acceleration of clearing of vascular lesions and tattoos. Patient satisfaction has generally paralleled the response of the treatment, with increased satisfaction related to the Versapulse treatment following waning enthusiasm to the initial plateaued response to other lasers.

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CHANGES IN SKIN REDNESS, PIGMENTATION, ECHO-STRUCTURE, THICKNESS, AND SURFACE CONTOUR FOLLOWING ONE TREATMENT WITH THE PULSED DYE LASER OF PORT-WINE STAINS IN CHILDREN

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The pulsed dye laser is the treatment of choice for PWS in children. Evaluation of treatment outcome and side effects is traditionally based on subjective clinical scoring systems. We intended to objectify treatment results and adverse reactions. The study was designed as a before-after trial using skin reflectance to detect changes in skin redness and pigmentation, ultrasonography to evaluate changes in echostructure and skin thickness, and three-dimensional surface contour analysis to detect surface texture changes. Twelve children with PWS were included. The skin reflectance-determined change in *skin redness* correlated with the clinical response ($r=0.46$, $p<0.002$). The percentage of reflectance-determined lightening was equal for pink, red, and dark-red PWS (median 42.9%). *Skin pigmentation* increased after laser treatment ($p<0.007$). Ultrasonography revealed lower dermal *echogenicity* of preoperative port-wine stains than of post-operative ($p<0.007$) and normal skin ($p<0.0008$). An increase in echogenicity reflected a decrease in the dermal water (blood) content. *Skin thickness* was significantly higher in PWS before treatment than after ($p<0.0007$). *The surface contour parameters* decreased significantly after laser treatment, indicating a flattening of the skin surface. The contour changes correlated positively with treatment response. By clinical evaluation no hypopigmentation or texture changes could be detected. We conclude that the evaluation of treatment outcome and side effects is refined by skin reflectance ultrasonography, and surface contour analysis.

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AN ADJUNCTIVE APPROACH TO RESURFACING UTILIZING A CO₂ LASER, ERBIUM:YAG LASER, DERMABRASION AND CHEMICAL PEELING

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With the advent of pulsed and shuttered CO₂ lasers and Erbium:YAG lasers, there has been a great resurgence in resurfacing interest among dermatologic and cosmetic surgeons. Frequently, an optimal clinical outcome is best achieved using a combination of these resurfacing modalities rather than just the one. A series of patients treated over the past five years for a variety of indications including diffuse photodamage, extensive actinic keratoses, rhytides, surgical and acne scars were treated with a combination of resurfacing treatments, including Erbium:YAG laser, CO₂ laser, wire brush and diamond fraise dermabrasion and medium depth chemical peeling. Photographic documentation of their clinical course was assimilated with the treatment modalities and laser settings employed. Combination treatments were compared with single modality treatments for similar pre-operative indications. An excellent clinical and post-operative outcome can be achieved by tailoring the surgical approach to the patient's pre-operative surgical indications. By combining these modalities, one can offer the greatest amount of surgical benefit with the smallest degree of post-operative morbidity and complications.

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Laser assisted endoscopic reduction malarplasty in Asians: Quick Combined Surgery.

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BACKGROUND: Removal of unwanted prominent cheek bone is one of the major importance to Korean women for correction of their unfavorable impression. We usually use a endoscope for reducing external scar, but attempting endoscopic bone contouring surgery, it is important to prevent any damage to surrounding soft tissue during osteotomy and to control of bleeding without facial nerve damage with clean endoscopic visual field.

PURPOSE: Efficacy of Nd-Yag Laser on endoscopic facial contouring surgery.

METHODS: We used endoscopic surgery equipment and Ultrashort pulsed endoscopic contact Nd-Yag laser (Japan SLT) and various laser fiber tips and osteotomes. 21 patient who underwent laser assisted endoscopic reduction malarplasty with longer than 1 year of follow ups were evaluated. **RESULTS:** All patient treated above procedures demonstrated no complication with favorable result.

CONCLUSION: Comparing to conventional endoscopic osteotomy, this combined procedures was found to be safe and effective in endoscopic reduction malarplasty, due to provided clean visual field and excellent hemostasis.

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Preliminary Analysis of Laser Resurfacing with the Erbium/Yag Laser

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Purpose:

To evaluate the effectiveness of Erbium/Yag lasers in improving facial rhytides and to determine the time to achieve mild post-healing erythema.

Method:

33 patients (32-female, 1-male) had facial rhytides which ranged from 1 to 4 in severity. Patients were classified as Fitzpatrick skin types. All treatment was performed by one laser surgeon and included resurfacing of the forehead, perioral, periorbital or entire facial region. A (ConBio) Erbium/YAG laser was used. A 5mm spot size, 800 mj to 1 joule, 5 to 10Hz freq. were the parameters. Physician assessment of the degree of clinical improvement, post healing erythema and presence of pigmentary alterations were performed using serial photographs. Median follow up was 5 months.

Results:

The majority of patients had type 2 rhytides and were classified as Fitzpatrick skin type 2 or 3. Regression of initial rhytides improvement occurred when two or three passes were performed. Lower eyelid type two rhytides that improved 90% or more required at least 4 passes at 5Hz or 3 to 5 passes at 10Hz. Perioral type 2 rhytides that improved 90% or more required 4 or more passes at 10Hz. Visual criteria associated with the best results were the effacement of mild to moderate rhytides, petechial bleeding and chamomile color. The time to achieve post healing mild erythema was 8-days (range 4 to 22 days). Five cases of mild hyperpigmentation occurred.

Conclusion:

1. The Erbium/Yag laser is effective in producing sustained improvement in mild to moderate rhytides.
2. Mild post healing erythema was achieved within 8 days in most patients.

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PROPHYLACTIC ANTIBIOTICS FOR CO₂ LASER RESURFACING. Neils Krejci-Papa, Richard E. Fitzpatrick, Mitchel P. Goldman, Woraphong Manuskiatti, San Diego, CA

Purpose: CO₂ laser resurfacing of the face produces a superficial 2° burn. There is a high risk of contact dermatitis to topical antimicrobial creams. To reduce the risk of infection, we investigated several prophylactic regimen and analyzed the type of infections that occurred.

Method: 352 patients underwent CO₂ laser resurfacing from May 1st 1996 until July 15th 1997. During the healing period, 47 patients had cultures taken to rule out infections in clinically suspect cases. In 22 cases fungal or bacterial infections could be identified. Symptoms were often subtle: failure to heal equally in all areas, increased crusting, yellowish exudate, pustules and clear blisters.

Results: Without antibiotic prophylaxis, bacterial infections occurred 8.3% of cases 3-12 days post-op (avg. day:6.1). *Staph aureus* was the predominant strain (4.7%) often combined with a gram neg. species. With prophylactic Cipro 500 mg bid x 7 days post-op, only 2.7% of patients developed bacterial infections, but only after Cipro was discontinued: from day 9-18 post-op, avg. day 13.4. For 7 months patients were randomly assigned to receive either Bactroban intranasally qid 3 days pre- to 7 days post-op or no intranasal treatment. All *Staph. aureus* infections that occurred were seen in patients that had used Bactroban intranasally. The majority of gram neg. infections were enteric bacteria pointing to a lack of domestic hygiene. Yeast infections were seen in 5 patients (1.4%) but only after 10 days post-op: from day 10-17, avg: 12.8. Yeast infections were more frequent in the Cipro group (2.2%) than in the non-Cipro group (0.6%). Patients with a history of yeast infections were given antifungals for 5 days post-op and none of them developed a fungal infection later on.

Conclusions: Infections post CO₂ resurfacing are not rare but can appear subtle and might only be noticeable in the second week. Prophylactic

intranasal Bactroban is ineffective in preventing infections, but oral Cipro is effective for both gram pos. and gram neg. bacteria. The question of anti-staph prophylaxis vs. both gram pos. and gram neg. coverage needs consideration.

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EVALUATION OF THE PHOTOGENICA LPIR LASER FOR HAIR REMOVAL

Jenifer R. Lloyd, Youngstown, Ohio.

The purpose of this study was to evaluate the effectiveness of the Photogenica Long Pulsed Infrared (LPIR) laser on the removal of unwanted hair.

In this study, patients volunteered to have a 4x6 cm area on their right lower leg treated with the Photogenica LPIR laser. No anesthesia or waxing was used for this study. The laser settings remained constant for each treatment: 20 msec pulse duration, 20 J/cm², 10 mm hand piece. The patients were treated at monthly intervals for 4 months with follow up at 3 and 6 months. Hair counts and computer generated images were used to document the results.

Patients treated with the Photogenica LPIR laser had significant long term reduction in hair growth. No scarring or pigmentary changes were noted. The Photogenica Long Pulsed Infrared laser is a safe and effective tool for long term reduction in hair growth.

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LASER-VIDEOSCOPY AND SCLEROTHERAPY OF TELANGIECTASES

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Today sclerotherapy is the elective treatment for most cases of telangiectases. The main exceptions are "red" telangiectases, those with a caliber < 0.3 mm and those with high flow, which do not respond to sclerotherapy or are aggravated by it as they require high concentrations of locally and generally toxic sclerosant solutions. We treated these telangiectases with laser photocoagulation and two different techniques, utilizing also the videocapillaroscope. This tool allows to appraise the superficial dermal microvessels. Modifying the last part of such device, we have inserted an optical fiber in the visual cone of the television camera, that transport a laser ray of different wavelength. In first time we chosen to use a Argon laser of 488 and 514 nm of wavelength, because it is very less expensive and reliable, respect to other types of laser today used in the treatment of telangiectases. Now, we used also other wavelength (585, 755 nm). We have five objectives: to treat all types of telangiectases, to reduce doses and concentrations of sclerosant drugs, risks of side effects and recovery time, and to increase the long-term effects of the treatment.

The vessels with calibers < 0.3 mm were irradiated over their entire length, while those ranging from 0.3 to 3 mm were only irradiated at the ends, to interrupt flow partially and cause a preliminary whitening of the entire vascularized zone. The still pervious vessels in the same area, probably supplied by penetrating vessels and microfistula A/V, were injected with low concentrations of sclerosant solution. This method is known as combined lasersclerotherapy. From 1985 to 1996, we have treated 731 cases of telangiectases of the lower limbs, over 221 cases of facial telangiectases and 25 cases involving the neck and suprasternal region. The results allow us to

conclude that combined lasersclerotherapy should be considered the elective treatment for red and non-sclerotizable telangiectases of lower limbs. Laser photocoagulation with many wavelength is the elective treatment for the facial telangiectases. We prefer 488, 585 and 755 nm, according to different types of telangiectases. In the last two years, the associated use of the videocapillaroscope allows to simplify the technique of the treatment, and allows to achieve four on five objectives prefixed, with very good results. The evaluation of long-term results required still a longer follow-up.

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DIODE LASER THERAPY OF INDURATIO PENIS PLASTICA

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Since 1981 we have proposed laser as a physical therapy as well as a surgical one. Infact, according to many Authors, lasers with low energetic density, with emission on visible and infrared spectrum and with dosages respectively between 6 and 4 Joules per scm, inhibit fibroblastic activity and collagen formation. The purpose of our study is to verify the action of defocalized diode lasers in some clinical variations of this syndrome and, if the indication exists, to establish the type of laser and the exact dosage of radiation to use in selected cases.

The selection of the patients done according to our protocol previously proposed (patients with I.P.P. of at least six months duration and with positive test of spontaneous erection) and our experience, excluding too the cases with circular plaques and/or calcified plaques, which haven't positive results after laser treatment, in the past years.

In 1997, we divided the patients in randomized groups and we used for each group the same dose of radiation, but lasers of different wavelengths (670, 780, 904 nm).

The evaluation of the results based on the variation of the parameters pain, recurvatio, signs of phlogosis and ecographic findings.

Some difference of the results are shown between the various group, and we controlled the follow-up after three months of the treatment.

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TREATMENT OF BECKER'S NEVI WITH Q-SWITCHED RUBY AND LONG PULSE RUBY LASERS. LC Lucchina, JM Grevclink, Dermatology Laser Center, Massachusetts General Hospital, Boston, MA.

Becker's nevus is a cutaneous hamartoma that presents in the second decade with a light brown enlarging macular lesion that eventually develops hypertrichosis. The histopathology reveals increased pigmentation in the basal layer with often an increase in melanocyte number. Occasionally, there are large numbers of smooth muscle fibers in the reticular dermis. We present seven subjects with Becker's nevi treated with Q-switched and long pulse ruby lasers. After several treatments, there was uniformly a decrease in the pigmentation and hair density in the lesions. During treatment,

hypopigmentation, hyperpigmentation, erythema and textural changes were noted. Most changes were found to be transient, although some patients experienced permanent (mild) hypopigmentation. Our results demonstrate that the QSR and LPR lasers are a safe and effective modality in the treatment of Becker's nevi.

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VERRUCOS EPIDERMAL NEVUS

Authors Bonassi M

Macedo, O. - Sao Paulo-Brazil

The authors present a poster of a child, 7 years old, with verrucous epidermal nevus, located in the pre-auricular area and scalp, treated with CO2 Laser Ultra Pulse with excellent results.

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EFFECT OF THE LONG PULSE RUBY LASER FOR HAIR REMOVAL ON SEBUM EXCRETION

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PURPOSE: To investigate long-term effect of the long pulse ruby laser for hair removal on sebum excretion.

METHODS: Sebum excretions of 16 subjects were measured quantitatively using sebum-absorbent tape and image analysis techniques on laser treated sites, compared to adjacent untreated areas. All of the subjects received two treatments at an average of 4 weeks interval with double pulsing of fluences from 30 to 50 J/cm². Treated sites included back and thigh. Evaluation was done at an average of 9 months (4.5 to 12) after the last treatment. Sebum samples of several subjects were also analyzed by thin layer chromatography (TLC).

RESULTS: There was a significant ($p \leq 0.05$) increase in sebum production among the 16 subjects, in laser-treated vs. adjacent untreated skin. 11 subjects (69%) had higher sebum excretion on the treated sites. 1 of these reported an acneiform eruption with spontaneous resolution. 3 subjects (19%) showed lower sebum excretion on the treated sites, and 2 subjects (12%) demonstrated no difference in sebum excretion on treated and untreated areas. Pulsewidth (0.3 and 3 msec) and anatomic site had no apparent effects on the results. At the time of preparing this abstract, TLC analysis of sebum is in progress.

CONCLUSIONS: A variable, significant increase in sebum excretion occurs many months after ruby-laser hair removal treatment at high fluences. We hypothesize that decreased resistance to sebum outflow may explain this result, following miniaturization or absence of hair shafts after ruby laser treatment.

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CO2 LASER AND HAIR TRANSPLANTATION

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Day-Clinica Dr Morselli

MODENA - Italy

Since 1984 we perform hair restoration surgery for every degree of androgenetic baldness employing the "punctiform technique" invented by Dr. Carlos Oscar Ubel, which allows the transplantation, in a single session lasting from 2 to 3 hours, of about 1000/1500 micro- and minigrafts of scalp carrying 2500/4000 hair, making scalpel cuts where follicles are introduced.

The CO2 laser is able to make in the scalp holes of predetermined dimensions (diameter, depth), direction and shape with a proper regulation of energy density and angle of incidence of the laser beam.

Since 1982 the laser is used in our office, and from 1995 we employ it in baldness surgery to perform the ablation of the "donor strip" in the backhead, and to make the holes for the follicles in the recipient area.

The CO2 laser has turned out profitable whenever remarkable bleeding of the scalp is present; in such cases there is a reduction of time as compared with the traditional technique for the hemostatic action on small vessels.

It is a safe rule also for surgeons who usually do not employ the laser for this type of operations, to have anyway a laser at their disposal in case they need it.

The taking hold follicles, the growth time of hair, and the final aesthetic result are similar to the outcomes of the traditional technique using the scalpel.

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HERPES SIMPLEX VIRUS PROPHYLAXIS FOR CUTANEOUS LASER RESURFACING: A COMPARISON OF ACYCLOVIR, VALACYCLOVIR, AND FAMCICLOVIR

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PURPOSE: To determine the clinical and cost-effectiveness of three anti-viral drugs for herpes simplex virus (HSV) prophylaxis during cutaneous laser resurfacing.

METHODS: A prospective analysis of patients receiving prophylaxis therapy for herpes simplex infection during cutaneous carbon dioxide laser resurfacing was initiated. Fifty patients undergoing full face or perioral resurfacing received either acyclovir 400mg tid, famciclovir 500mg bid, famciclovir 250mg bid, or valacyclovir 500mg bid. Patients initiated treatment 24 hours prior to surgery and continued the anti-viral medication for 10 days. Rates of HSV infection were calculated for each group based upon both laboratory and clinical evidence of viral infection. Cost analysis was performed based upon dosing schedules and drug wholesale pricing.

RESULTS: An equal subset of patients in each anti-viral group experienced a breakthrough of herpes simplex infection after laser resurfacing. Average time to onset of symptoms was 5 days. Anti-viral medications were increased once herpes was diagnosed with the majority of patients responding within 2-3 days. A single case of cutaneous disseminated herpes simplex infection occurred in a patient with a strong history of HSV labialis and genitalis in the famciclovir 500mg bid group. Acyclovir and famciclovir 250mg were most cost-effective.

CONCLUSIONS: Acyclovir, famciclovir, and valacyclovir are effective for herpes simplex prophylaxis during cutaneous laser resurfacing. These drugs differ in their bioavailability, dosing schedules, and expense. Therefore, drug choice must be determined by weighing economic and dosing convenience factors along with efficacy data.

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COMPLICATIONS OF LASER-ASSISTED HAIR REMOVAL USING THE Q-SWITCHED Nd:YAG, LONG-PULSED RUBY, AND LONG-PULSED ALEXANDRITE LASERS

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PURPOSE: To identify the unique side effect profiles and complication rates of three different hair removal systems.

METHODS: A retrospective chart review of 200 patients treated for hair removal using either a carbon-assisted Q-switched Nd:YAG laser, long-pulsed ruby laser with cooling handpiece, or long-pulsed alexandrite laser was performed in order to identify the side effects and complication rates of laser-assisted hair removal. Chart reviews and photographic analyses were performed in order to identify factors which may have contributed to poor outcome. Patient skin types, anatomic regions treated, energy fluences, and treatment protocols are reported. Pretreatment test spots were performed in patients with dark skin types.

RESULTS: Patients treated with the carbon-assisted Q-switched Nd:YAG laser experienced the least number of complications with fewer than 5% of treatments resulting in epidermal blistering, erosions, or prolonged skin irritation. The long-pulsed ruby and alexandrite laser systems resulted in several more cases of blistering, fine epidermal crusting, and pigmentary changes. Complications correlated directly with skin type, degree of sun exposure, and high treatment fluences. No permanent scarring or textural changes are reported. The ruby laser was least painful for patients intraoperatively. Test spots were poor indicators of potential treatment complications.

CONCLUSIONS: Laser-assisted hair removal is safe with a low complication rate when proper patient selection and treatment fluences are chosen. Patient skin type, degree of sun exposure, and energy fluences are key factors determining treatment outcome. Early intervention and aggressive postoperative management are essential for the successful treatment of laser-induced complications.

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Treatment of extensive lesions of molluscum contagiosum with 585nm pulsed dye laser in immunocompromised patients.

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Molluscum contagiosum in patients with HIV disease is challenging and most destructive methods are unsuccessful. Aggressive lesions of molluscum are often a marker of late stage HIV disease. We report the successful treatment of molluscum contagiosum in 5 patients with HIV disease. In all patients, traditional destructive methods including cryotherapy, TCA treatment, cantharidin treatment, tretinoin had failed. Two of the five patients had also received high dose cimetidine and had failed treatment. One patient had extensive involvement of both eyelids, making destructive therapy even more challenging.

Five patients with advanced HIV disease and extensive lesions of molluscum contagiosum were treated with the Cynosure V Photogenica FPD 585nm laser. Test sites were performed to optimize fluence parameters and determine efficacy of treatment. One patient showed complete resolution of lesions after one treatment. In the other patients, multiple treatments were necessary.

Follow-up was performed for 6 months.

We conclude that pulsed dye laser therapy may be effective for treating lesions of molluscum contagiosum. Proposed mechanisms remain to be elucidated.

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DISSEMINATED SUPERFICIAL ACTINIC POROKERATOSIS TREATED WITH FREQUENCY-DOUBLED Q-SWITCHED Nd:YAG LASER

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Disseminated superficial actinic porokeratosis is uncommon genodermatoses, characterized by numerous superficial crusty brownish macules with a typical rim of hyperkeratosis (cornoid lamella) especially on the exposed areas, and is often quite resistant to conventional therapies. Our purpose was to determine whether 532nm Q-switched Nd:YAG laser could remove porokeratotic macules in DSAP patients.

Five patients (one man and four women) with extensive DSAP were treated with a frequency-doubled, Q-switched Nd:YAG laser (532nm, 10nsec) at fluences between 2.8 J/cm² and 6.0 J/cm² (average 4.27 J/cm²). Numbers of treatment varied from one to five treatments. Three patients showed excellent responses, one showed good response, and another showed fair response to laser treatment. All five patients showed improvements after laser treatment and the lesions did not recur during follow-up up to 20 months. One showed mild postinflammatory hyperpigmentation which faded out after six months. There was no evidence of scarring.

The frequency-doubled, Q-switched Nd:YAG laser appears quite effective in removing DSAP lesions without serious side effects.

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EPIDERMAL NEVUS SYNDROME: A REVIEW AND CASE REPORT

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The Epidermal Nevus Syndrome is a disease complex of epidermal nevi and developmental abnormalities of the integumentary, ophthalmologic, nervous, skeletal, cardiovascular, and urogenital systems, and associated malignancies. The syndrome is sporadic in nature, variable in clinical presentation, and demonstrates patchy distribution of abnormalities in many other organ systems. We present a case of congenital systematized verrucous epidermal nevus syndrome in a male with skin lesions covering approximately 80% TBSA. Nevi covered his face, neck, axillae, upper extremities, trunk, groin, and thighs. Skin lesions ranged from pigmentation changes to thickened, raised, confluent, verrucous growths greater than a centimeter in height. He

underwent staged treatment of his epidermal nevi with CO₂ laser utilizing two different techniques. The larger verrucous lesions were initially debulked by shaving them tangentially in a free-hand mode via a 125 mm handpiece in a slightly defocused position. The resulting defects and thinner lesions were then treated using the Silk Touch modality, a computerized scanner. Trunk and extremity lesions were treated with 120 watts in a continuous mode via a 200 mm handpiece. Facial lesions were treated with 120 watts via a 125 mm handpiece. The lesions were sequentially dermaplaned until completely ablated. Topical dressings were applied, and now, in a two year follow-up, has experienced no recurrence. The advantages of CO₂ laser dermabrasion with the Silk Touch technique are less thermal injury to surrounding tissue and more rapid ablation at higher power with increased safety.

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Histological evaluation and follow-up of combined laser treatment embolisation and surgery for the therapy of vascular malformations in the maxillofacial region.

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Object of the study: Vascular malformations are often inborn angiodysplasias and can be summarised as well as hemangiomas in the group of congenital vascular disorders (CVD). A careful classification from an hemangioma is available with the help of appropriate diagnostic procedures as the MRI and the angiography and the CCDS. The vascular malformation shows no spontaneous regression so that a treatment is unavoidable in opposite to the hemangioma unless residuals are accepted.

Material and Methods: In the first patient embolisation was used to minimise the arterial perfusion of the angiomatous vessels in the first step. In the second step we have treated the patient with transcutaneous and interstitial laser therapy. Istological examination of a vascular malformation before and after the combined treatment with embolisation and laser (transcutaneous and interstitial) parallel to other diagnostic proceedings like the CCDS were used to evaluate the follow-up of the vascular malformations and to proceed to a final surgical operation. Diagnostic proceedings like the CCDS, Laser-Doppler and the Thermography were used to our second patient a 60 years woman with a VM on the lip who was treated with a combined laser and plastic surgery treatment.

Results: The histological examination supplied by the other diagnostic methods have demonstrated an obliteration of small vessels by the fibrotic changes following transcutaneous or interstitial lasertherapy. In addition by the embosation in the first patient was achieved necrotic tissue in the vascular malformation. With the laser therapy a reduction of the arterial and venous perfusion was achieved followed by a rebuilding of connective tissue in the area of the VM. Based on the histological estimation in we could proceed safely to the second step treatment as the plastic surgery as the risk of bleeding existiert no more.

Conclusion: With the transcutaneous or interstitial laser therapy in combination with the embolisation of vessels -where available- and the plastic surgery we can have excellent results with minimised risks during the interventions.

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The use of topically applied photosensitizers. The Neukölln experience in the treatment of lesions in the maxillofacial region.

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Object of the study: Photodynamic therapy has tried over the years to solve

problems arising from the surgical removal of maxillofacial lesions like large deformities, and resulting symptoms including dysphagia, odynophagia, dysarthria, and upper airway destruction. Certain aspects of the local application of photosensitizers (PS) as selectivity and specificity as well as the absence of systemic toxicity and photosensitivity, and a possible photosensitizer-mediated photoinactivation of enveloped viruses and bacterial lesions may be efficacious for the treatment of maxillofacial regions.

Material and Methods: Considering the problems of a systemic administration we have preferred to apply topically the PS on the lesion.

The PS used were 5-Aminolävulinsäure 3g Tylose H300 Gel 3% ad 10g and Toluidinblau-O 0.05g Tylose H300 Gel 3% ad 10g. Both PS were topically applied in precancerous as well as benign lesions of the maxillofacial region.

In 3 superficial benign maxillofacial lesions (3 Leukoplakia, 3 Aphthe) we have applied a gel of Toluidinblau O for 10min and in 3 precancerous lesions (Basaliom right ear, nose, stirn) 5-ALA gel for 5 hours. The laser we have used were a flash pumped dye laser of 633.8nm and a diode laser of 670nm.

Results: A 60% reduction was achieved after the first treatment of leukoplakia which was situated in the left cheek of the patient. For a complete disappearance of this leukoplakia 2 more treatments. The leukoplakia which was situated in the right cheek had shown a complete reduction after the first visit. The Aphthe have shown a complete disappearance after 2-10 days with a reduction of pain some hours after the first treatment. The precancerous lesions has shown a 80-100% reduction after the second treatment. Regarding the use of the 670nm in the case of leukoplakie we didn't have a reduction because of the little energy density of the laser. Nevertheless the good results at the treatment of aphthe could be explained from the antibacterial effect of the applied PS (Toluidin-blau O).

Conclusion: In spite of the problems that have been arising during this treatment modality, like the pain that causes the PPIX produced from the 5-ALA by the topical application and the colouring of surrounded areas by the TBO we could conclude by our results that a topically applied PS would contribute to a minimal invasive treatment. Topical photodynamic therapy (PDT) with 5-ALA is especially effective in the treatment of superficially localized precancerous lesions. With the use of TBO gel in benign lesions we need no local anesthesia. Also because of the antibacterial effect of this dye we could avoid a postoperative superinfection.

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Modulation of Collagen Production in Healing Rabbit Achilles Tendons by Laser Photostimulation

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This study was designed to evaluate the influence of laser photostimulation on collagen production in experimentally tenotomized and repaired rabbit Achilles tendons. Following tenotomy and repair, the surgical hind limbs were immobilized in customized polyurethane casts. Then, the experimental animals were treated with 6382.8 nm He:Ne laser photostimulation daily at 1.0 J cm⁻² for 14 days. Control animals were sham treated with the laser head. On the fifth day after repair, the casts were removed to allow the animals to bear weight on the lower extremity. The animals were euthanized on the fifteenth post-operative day, the Achilles tendons were excised and processed for the analyses. Biochemical analyses of the tendons revealed significant differences in collagen concentration, collagen solubility profile and distribution of soluble collagen between control and laser treated tendons. The collagen content of the treated tendons was significantly greater than controls indicating a more rapid healing process with the laser photostimulation. Sequential extractions of collagen from regenerating tissues revealed that the laser photostimulated tendons yielded significantly higher concentrations of neutral salt soluble and insoluble collagen than control tendons suggesting an accelerated turnover of collagen with the laser photostimulation. A significant decrease in pepsin soluble collagen was observed in laser treated tendons compared to controls indicating an enhanced resistance of collagen to proteolytic digestion in photostimulated tendons. However, there were no statistically significant differences recorded in the concentrations of hydroxypyridinium cross-links and acid soluble collagen between treated and control tendons. In conclusion, the results of this study suggest that laser photostimulation enhances the healing of tissues by facilitating collagen production.

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Title Combination Full-Face TCA Cream Peel and Segmental Laser Resurfacing: Effective Treatment of Rhytides and Solar Dyschromia.

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In a great many patients presenting for consideration of full face laser resurfacing, the areas most affected by increased rhytids are the perioral and periorbital areas. The rest of the face is generally involved with solar degeneration and dyschromia. Treatment of the full face with a combination Jessner's solution/TCA cream peel just prior to laser resurfacing can decrease the morbidity of full face laser resurfacing while offering superior results in terms of healing time and final appearance.

Because of the inherent risks of intravenous or general anesthesia necessary for full face laser resurfacing, a combination of full face Jessner's solution/TCA cream peel and segmental laser resurfacing under local anesthetic offers a superior final result with decreased risks and side effects. Patients should be carefully selected for this combined modality, and reasonable expectations and a clear understanding of the risks, benefits, and alternatives of both procedures should always be kept in mind.

The combination of the Jessner's solution/TCA cream peel with segmental laser resurfacing offers the patient a less invasive and greatly pleasing rejuvenation of actinically damaged facial skin, decreasing side effects and risks, and delivering a superior final result.

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EFFICACY OF PULSED DYE LASER TREATMENT OF PORT WINE STAIN MALFORMATIONS ON THE LOWER LIMB.

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Pulsed dye laser (PDL) treatment is recognised as effective treatment for port wine stains (PWS). Of the few studies which have reported treatment responses with PWS on the lower limb, most have suggested that treatment is less effective when compared to facial sites. We have investigated the response of lower limb PWS to PDL treatment in one of the largest series reported to date.

42 patients (39F:3M) attending the Leeds Dermatology Laser Centre were included in the study. An semi-objective assessment of improvement was made by a single observer by comparison with baseline photographs, using a scale of excellent (75-100%), good (50-74%), fair (25-49%) and poor (0-24%). In addition the patients/or parents were asked to make a subjective assessment based on a visual analogue scale of 1 (no improvement) to 10 (clear). The median age of patients was 21(1.5-56) years and the majority of PWS treated were on the calf(23) followed by the thigh(11), shin(4), ankle(2) and knee(1). The median number of treatments was 8(2-22). 8 (19%) patients were graded as having an excellent outcome, 24 (57.1%) a good outcome, 9 (20.9%) had a fair outcome and 1 (2.3%) a poor outcome. The median patient assessment score for improvement was 7 (4-10).

26 (61.9%) patients experienced adverse effects. The majority(92%) were hyperpigmentation which faded usually within 6 months. One patient experienced atrophic scarring and one hypopigmentation both of which resolved. Hypertrophic scarring was not seen. Eight (18.6%) patients were observed to have perifollicular persistence of the lesion with greater improvement in the intervening skin. These appearances were seen predominantly on the lower leg, and have not been reported at other sites.

32(74.4%) patients stated that they were able to wear new clothes or become involved in new activities following to treatment of their PWS.

We conclude that the treatment of PWS on the legs with the PDL produces worthwhile improvement for the majority of patients, although complete clearing has not been observed to date. The clinical improvement is associated with a better quality of life for many patients.

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PHOTODYNAMIC EFFECTS INDUCED BY PROTOPORPHYRIN IX AND WHITE LIGHT IN THE HENS EGG MODEL

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Photodynamic Therapy with use of photosensitizing agents and laser light has been proven as a new treatment modality of malignant and nonmalignant diseases.

Since several years Protoporphyrin IX (PPIX) generated after application of 5-aminolevulinic acid (5-ALA) is increasingly used as photosensitizer.

In our study we chose the chicken chorioallantois membrane (CAM) of the fertilized egg as a model system. 5-ALA was applied topically on the CAM in different concentrations of 30 to 3·10⁴ mg 5-ALA/ml solvent. An incubation time of 2 hours has been chosen according to spectroscopic measurements which show a sufficient high amount of PPIX in the CAM assay. After that time an area of 0.6 cm² was illuminated homogeneously with white light delivered from a Xe-lamp through a liquid light guide. Applied light doses varied between 15J/cm² and 60J/cm². The photodynamic effect was judged immediately and 24 hours after irradiation by stereo microscopy.

In addition a histopathological examination was performed to evaluate the extent of necrosis on a microscopic scale.

The results show that severe damage of the CAM can be obtained with white light PDT. At the highest 5-ALA concentrations death of the chicken embryo can be induced. A complete stasis of the vessels was observed which partly regenerate after 24 hours. In order to assess the efficiency of white light PDT a comparison with laser irradiation at $\lambda=635$ nm is in progress.

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Photodynamic therapy in the treatment of cancer of tongue.

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In the State Research Center for Laser Medicine in 1992-97 years 46 patients with malignant tumors of oropharyngeal area (primary and recurrent) were treated with PDT using russian photosensitizers Photoheme ($\lambda = 630$ nm) and Photosense (sulphonated aluminium phthalocyanine, $\lambda = 670$ nm). Out of these 46 patients 13 were taken into therapy for cancer of tongue T₁₋₃N₀M₀ with the aim of radical treatment.

The treatment was performed in the out-patient clinic. Photosensitizer was administered intravenously. Only one serious complication was observed - massive tumor

necrosis with autointoxication. Complete tumour resorption was achieved in 10 cases (77%), in 3 cases (23%) - partial resorption. All patients are being followed-up in term from 4 to 36 months. Tumour recurrences in 12 and 16 months after PDT were found in 2 patients.

PDT is an effective technique for treatment of cancer of tongue. No cases of absolute tumour resistance to PDT were met.

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NEWS PROSPECTS WITH CO2 LASER

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PURPOSE: The purpose of this presentation is to show how some clinical situations could be solved with simple and efficacious CO2 Laser procedures.

METHODS: A pulsed CW CO2 Laser, focused or not focused, with a range of 1 to 3 Watts energy and 0.1 to 0.5 seconds pulse duration, has been used for treating patients with:

1-Sebaceous Cysts

2-Infestations with bots or ticks

3-Hemangiomas and Port Wine Stains

RESULTS: Sebaceous Cysts have been eliminated with no incisions, no bleeding, no sutures and in general, without anesthesia.

Bots or Ticks have been taken off after Laser shots, with immediately relief of Itch.

Satisfactory clinical results have been obtained when topical vaseline is applied on skin during treatment of Vascular Affections.

CONCLUSIONS: The Author has been demonstrating that CO2 Laser is a very versatile tool. With creativeness, a dermatologist and a CO2 Laser can together perform a large range of treatments, offering low cost, effectiveness, and good results to the patients.

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IT IS IMPORTANT TO LASER TREAT CHILDREN WITH PORT WINE STAINS AS EARLY AS POSSIBLE

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There is a commonly held conception among referring doctors that very small children with congenital capillary malformations, so called port wine stains (PWS), should not be treated until they are older. Our experience leads us to believe that the flashlamp pulsed dye laser is a safe and effective treatment even for infants. We have not encountered any persistent pigmentation change, post treatment scarring or other adverse effects. It is important to quantify the psychological disabilities associated with this disorder to assess the needs for and the benefits from treatment.

Method: Questionnaires were distributed to 259 patients and their families who visited our clinic because of their PWS. Patients who were on the waiting list for laser treatment, undergoing treatment or had completed their PWS. Patients who were on the waiting list for laser treatment, undergoing treatment or had completed their treatment

received different questionnaires. The response rate was 90%.

Results: High emotional distress was encountered. During the age periode 10-20 years 73% of the patients were most disturbed by their PWS. That the PWS influenced their life negatively was experienced by 75% of the patients, and 61% were convinced that their life would change radically if their PWS could be eliminated. Suffering from low self esteem (in comparison to the same age group) was reported by 47% of the patients. The PWS made their school life and educations more difficult according to 289 of the patients. Seventy six per cent of the relatives considered the patient to be negatively affected in some way by the PWS. After the laser treatment many of these distress parameters were significantly relieved.

Conclusion: We believe there is every advantage, including physiosocial, in starting treatment of all PWS (including the non-facial) at as early an age as possible.

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TISSUE EFFECTS OF THE ERBIUM YAG LASER WITH VARYING PASSES, ENERGY, AND PULSE OVERLAP.

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Purpose: The purpose of this study was to perform a histologic analysis of the tissue effects of the erbium YAG laser.

Method: Normal human skin was treated with the erbium YAG laser using 2 to 10 laser passes, fluences of 700 mJ/cm² to 24 J/cm², and pulse overlapping of 0 to 3. Depth of tissue vaporization and thermal damage was measured histologically.

Results: Increasing the number of passes correlated linearly with the depth of tissue vaporization and thermal damage. Pulse overlapping resulted in a two-fold increase in tissue ablation, but as much as a four-fold increase in thermal necrosis. Treatment of skin using subablative energies (700 mJ/cm²) showed no tissue vaporization or thermal damage.

Conclusions: Pulse overlapping with the erbium YAG laser causes a significant increase in thermal damage which may lead to scarring.

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CAPILLARY BLOOD INTAKE BY METHOD OF LASER BEAM CONTACTLESS SKIN PERFORATION.

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Owing to wide spreading of infectious diseases which transmit via blood - AIDS, hepatitis and others, the task of patient safety providing while blood intake is extremely important. However one shouldn't completely exclude the possibility of scarification repeated usage as a result of either laboratory assistant carelessness or the mistake. It is known that hemostasis efficiency while vital tissues laser cut is as high as the thermal coagulation necrosis layer is thicker and as quicker it is formed.

The thickness of this layer is determined by absorption coefficient L (or penetration depth) of laser emission in biotissue, and also by value of tissue temperature conductivity and the time of emission affection. The emission of crystalline laser YAG:Er ($\lambda = 2.94 \mu\text{m}$) has the record high absorption in biotissues. Absorption coefficient on $\lambda = 2.94 \mu\text{m}$ varies for different biotissues from 10^3 cm^{-1} to 10^4 cm^{-1} .

So we have chosen YAG:Er laser.

Taking into account the requirements of laser simplicity and reality, we have chosen multimode free generation with pulse duration approx. 100 mcs. While device designing we have taken into consideration all main requirements to devices of such purpose: emission focus into focal spot of very elongated form (the strip by length approx. 1 mm and by width approx. 0.1 mm) in order to provide good blood flow and wound healing; use of "tracking" emission for visualisation of "operating" emission focus position; vertical location of laser emitter.

Laser perforator "Quasar" has been recommended by Russian Ministry of Health for serial production and got Argentine approval. The perforator has been passed tests in some Moscow leading medical institutions: Main Clinical Hospital after Academician N.Burdenko.

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**EFFECT OF BOTULINUM TOXIN TYPE A ON
MOVEMENT-ASSOCIATED RHYTIDES FOLLOWING
CUTANEOUS CO₂ LASER RESURFACING**

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PURPOSE: Many patients who undergo cutaneous CO₂ laser resurfacing for correction of rhytides experience recurrence of movement-associated rhytides within 6 to 12 months following the laser procedure.

METHODS: Forty patients who received full-face CO₂ laser resurfacing were enrolled in the study. Twenty patients were subsequently treated with botulinum toxin type A to the forehead and/or glabellar regions when rhytides were first noted to recur. The remaining 20 patients did not have additional treatment and served as a control group. Clinical assessments were performed at baseline and at 3, 6 and 9 months following the CO₂ laser resurfacing procedure.

RESULTS: All patients treated with botulinum toxin type A following cutaneous CO₂ laser resurfacing demonstrated prolonged correction of forehead and/or glabellar rhytides compared to those patients treated with cutaneous CO₂ laser resurfacing alone.

CONCLUSION: The use of botulinum toxin type A following cutaneous CO₂ laser resurfacing results in prolonged correction of movement-associated rhytides.

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**SKIN PHOTOREACTION IN THE NUDE MOUSE MODEL
AFTER META-TETRA(HYDROXYPHENYL)CHLORIN
(mTHPC) / PHOTODYNAMIC THERAPY (PDT)**

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mTHPC is a novel photosensitizer which has shown promising results in different biological models. This study was designed to obtain the drug-light (D-L) intervals and light doses in which minimum skin damage was produced in immunodeficient nude mice after mTHPC (Foscan®)/PDT. Animals were i.v. injected with 0.51 mg/Kg of mTHPC and at 0.3, 2, 4 and 8 days D-L intervals were irradiated on 4 different skin areas (0.28 cm²) with 2.5 to 100 J/cm² light doses by a diode laser set at a wavelength of 652 nm and a constant power density of 0.1 W/cm². The skin response was monitored and evaluated daily by 2 independent observers for 10 days after laser irradiation using a visual scale system in which 5 grades of skin damage and 4 grades of subcutaneous edema were included. The results showed that there was a positive linear correlation between D-L intervals and light doses in which neither severe skin damage nor severe subcutaneous edema was detected (<2.5, ≤12, 25 and 50 J/cm² at 0.3, 2, 4 and 8 days D-L intervals, respectively). Results were expanded by determining the time course biodistribution of radiolabelled mTHPC. In conclusion, our findings showed that, the shorter D-L interval or the higher light dose, the higher skin phototoxicity or subcutaneous edema was produced. It was also demonstrated that nude mice are practical and reliable animal models for the assessment of skin damage in PDT using multiple irradiated spots on a single mouse.